FIG. 1

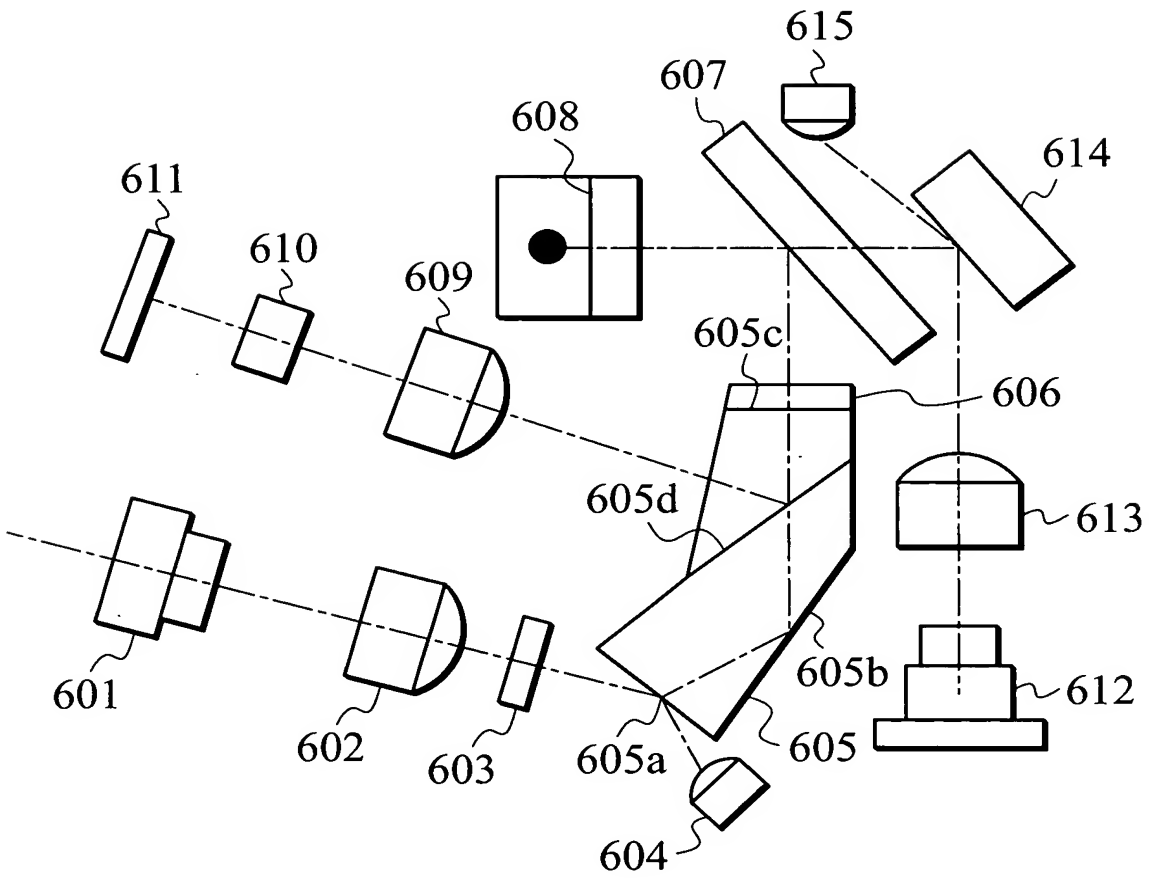

615
607
608
614
611
610
609
605c
606
605d
613
601
605b
612
602
603
605a
605
604

FIG. 2

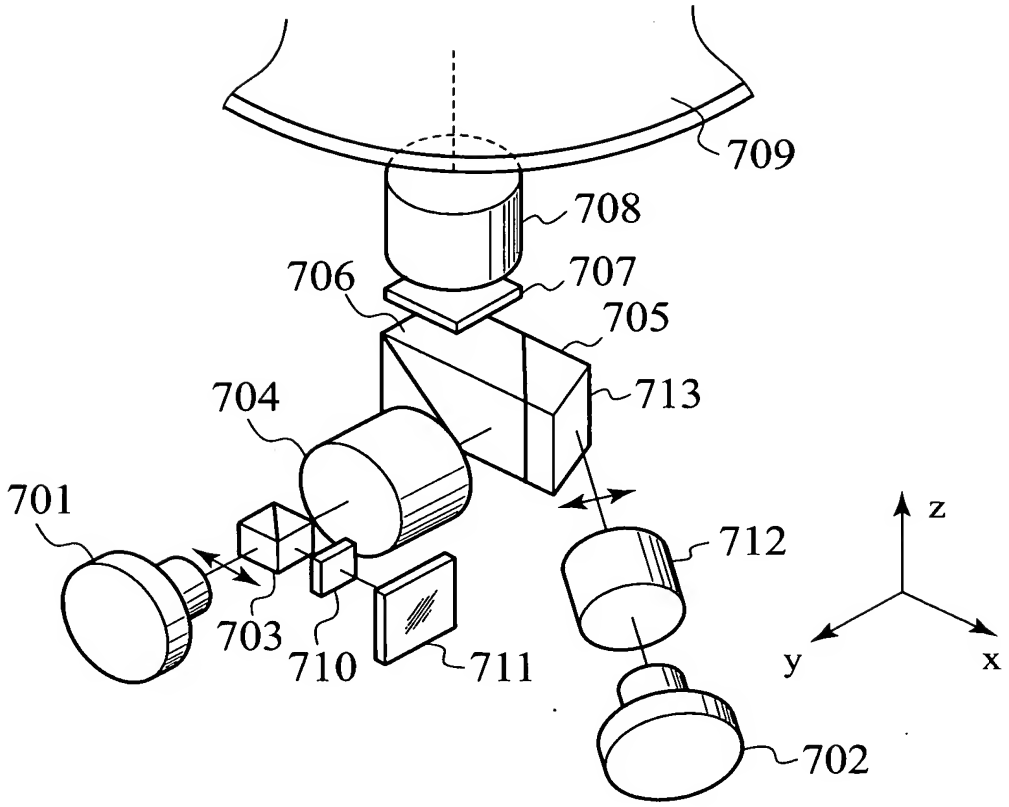

709
708
706
707
705
704
713
701
712
703
710
711
z
y
x
702

FIG. 3

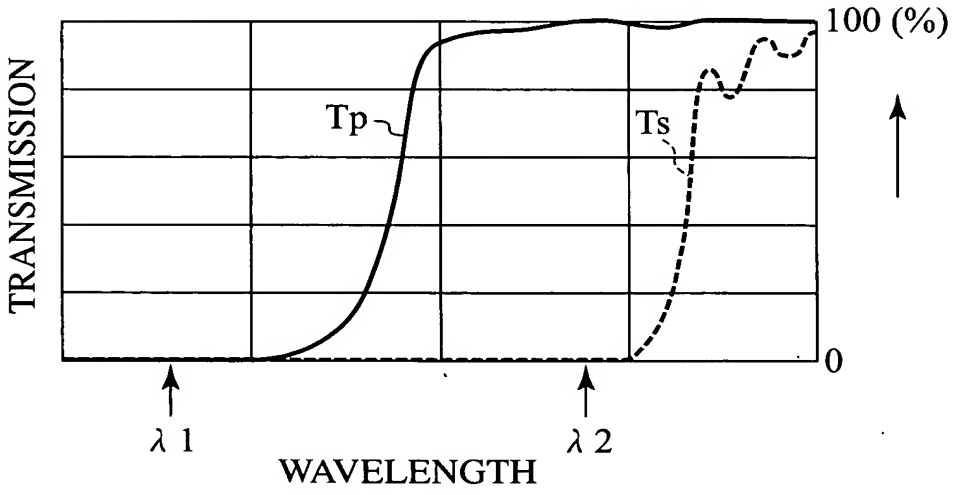

100 (%)
TRANSMISSION
Tp
Ts
0
λ 1
λ 2
WAVELENGTH

FIG. 4

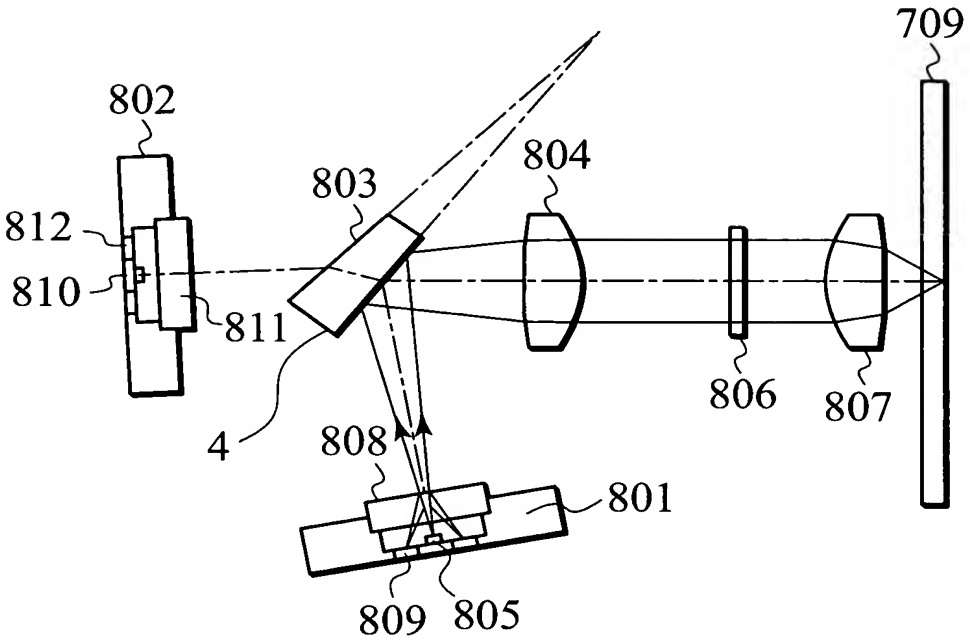

709
802
804
803
812
810
811
806
807
4
808
801
809
805

FIG. 5

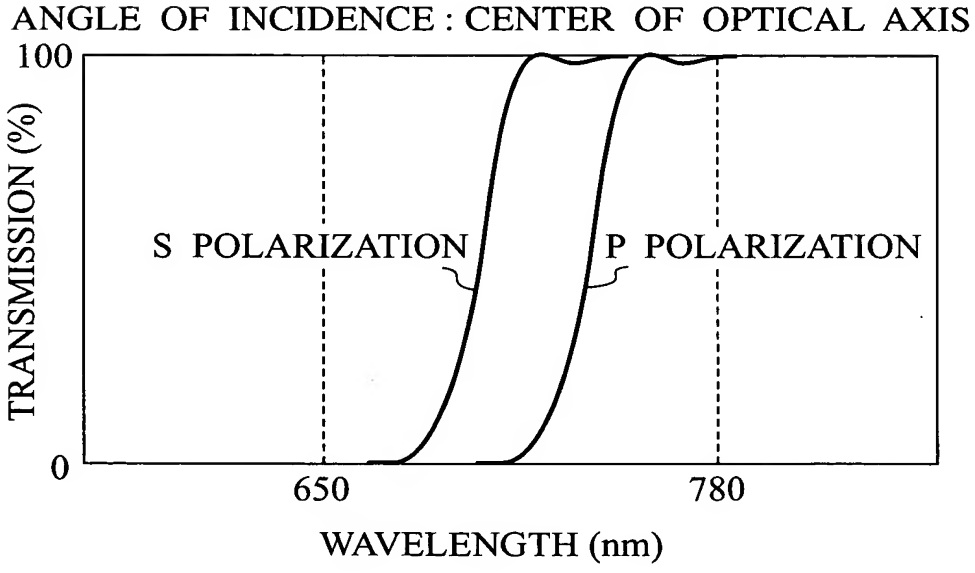

ANGLE OF INCIDENCE : CENTER OF OPTICAL AXIS
100
TRANSMISSION (%)
S POLARIZATION
P POLARIZATION
0
650
780
WAVELENGTH (nm)

FIG. 6

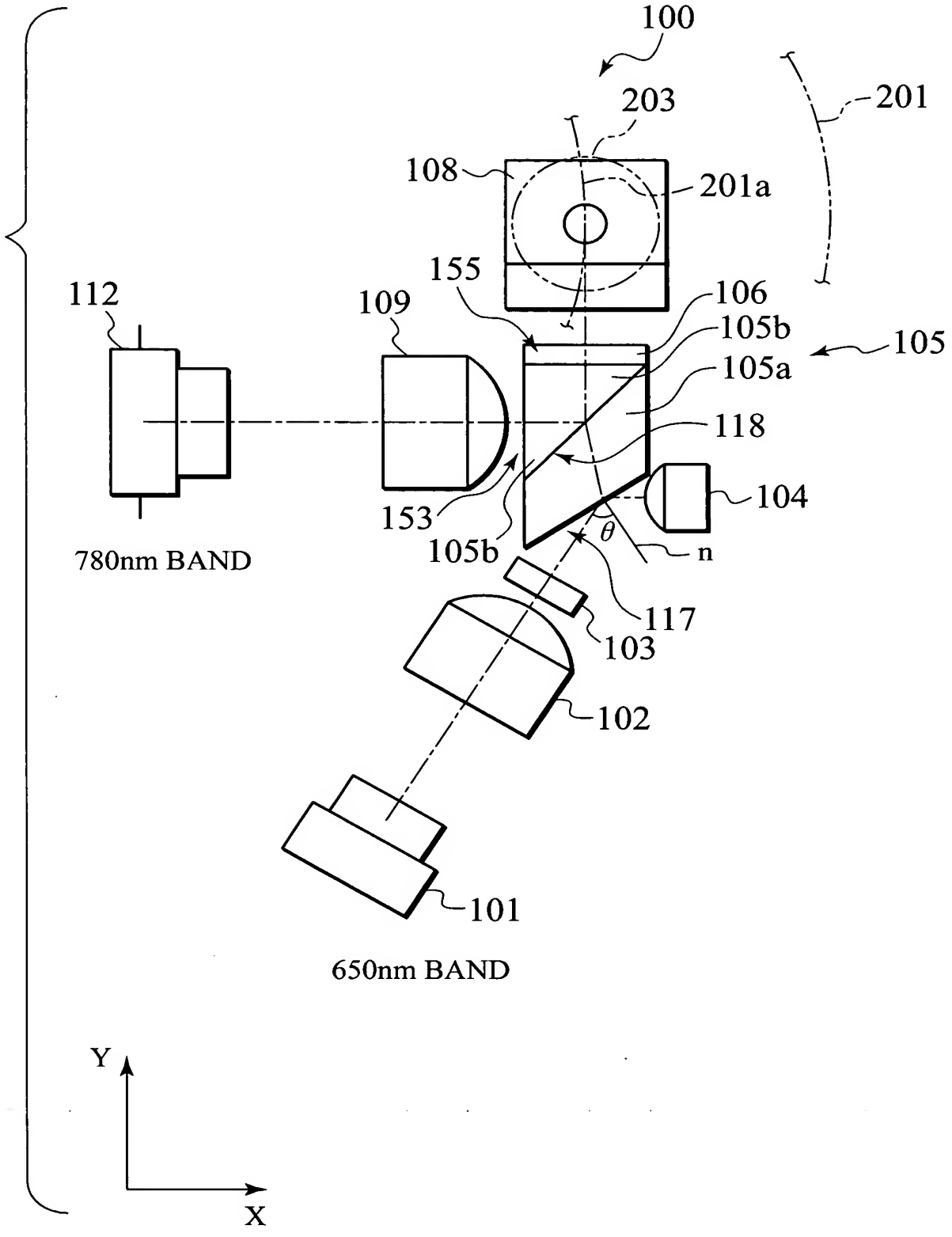

100
203
201
108
201a
155
112
109
106
105b
105
105a
118
104
153
105b
θ
n
780nm BAND
117
103
102
101
650nm BAND
Y
X

FIG. 7

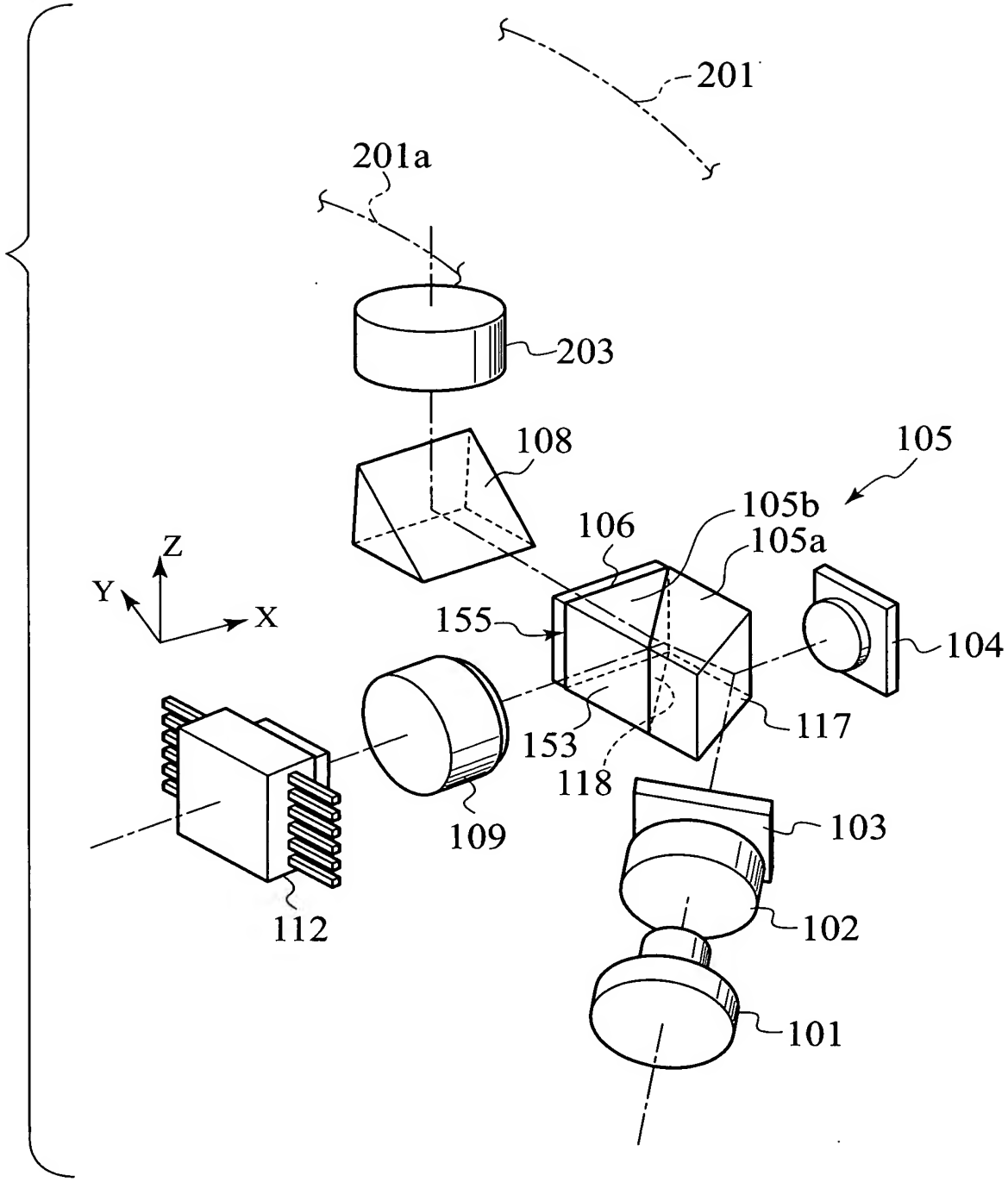

201
201a
203
108
105
105b
106
105a
Z
Y
X
155
104
153
117
118
109
103
112
102
101

FIG. 8

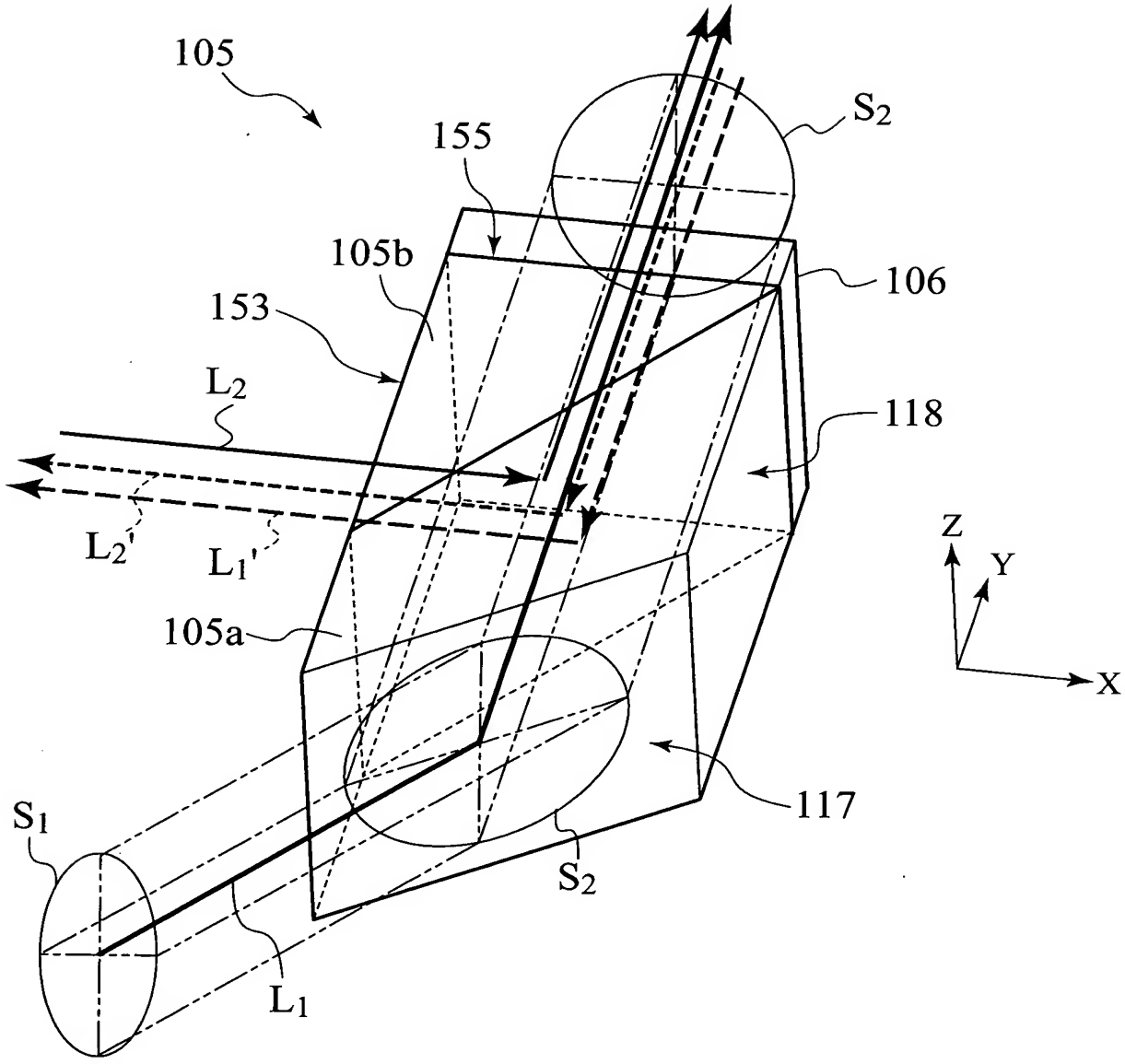


FIG. 9

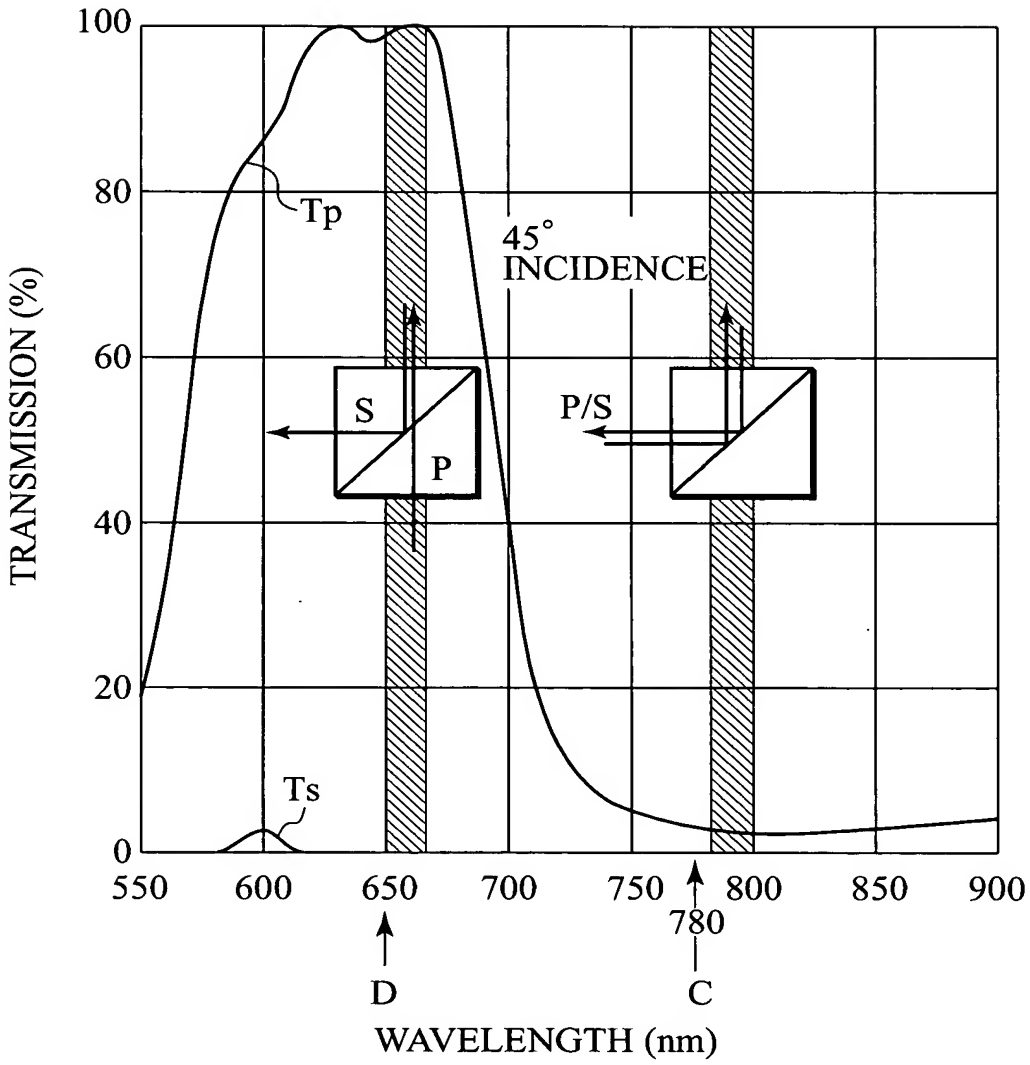

100
80
60
40
20
0
TRANSMISSION (%)
Tp
Ts
45°
INCIDENCE
S
P
P/S
550
600
650
700
750
780
800
850
900
D
C
WAVELENGTH (nm)

FIG. 10

A DESIGN EXAMPLE OF PBS / NPBS LAYER FOR WAVELENGTH SELECTION

		MATERIAL	REFRACTIVE INDEX (nd) [587.56nm]	THICKNESS [nm]
	GLASS	SF57	1.847	
1	L	Na_3AlF_6	1.35	658.89
2	H	TiO_2	2.24	322.7
3	L	Na_3AlF_6	1.35	513.28
4	H	TiO_2	2.24	114.12
5	L	Na_3AlF_6	1.35	495.34
6	H	TiO_2	2.24	139.92
7	L	Na_3AlF_6	1.35	574.28
8	H	TiO_2	2.24	107.23
9	L	Na_3AlF_6	1.35	494.98
10	H	TiO_2	2.24	178.46
11	L	Na_3AlF_6	1.35	215.26
	GLASS	SF57	1.847	

ANGLE OF INCIDENCE 45[deg.]

FIG. 11

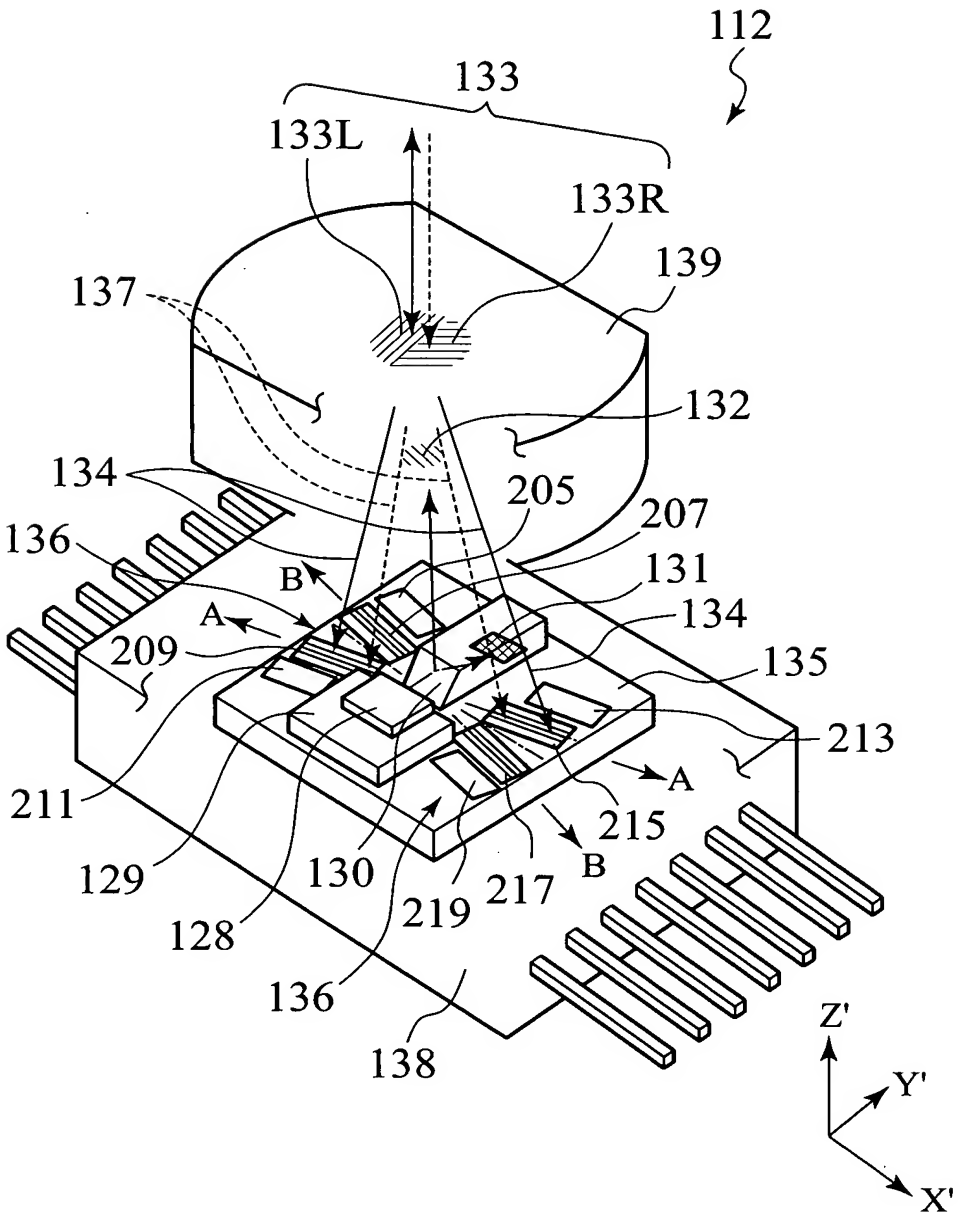

112
133
133L
133R
139
137
132
134
205
207
136
131
B
A
134
209
135
213
A
211
215
B
129
130
219
217
128
136
138
Z'
Y'
X'

FIG. 12

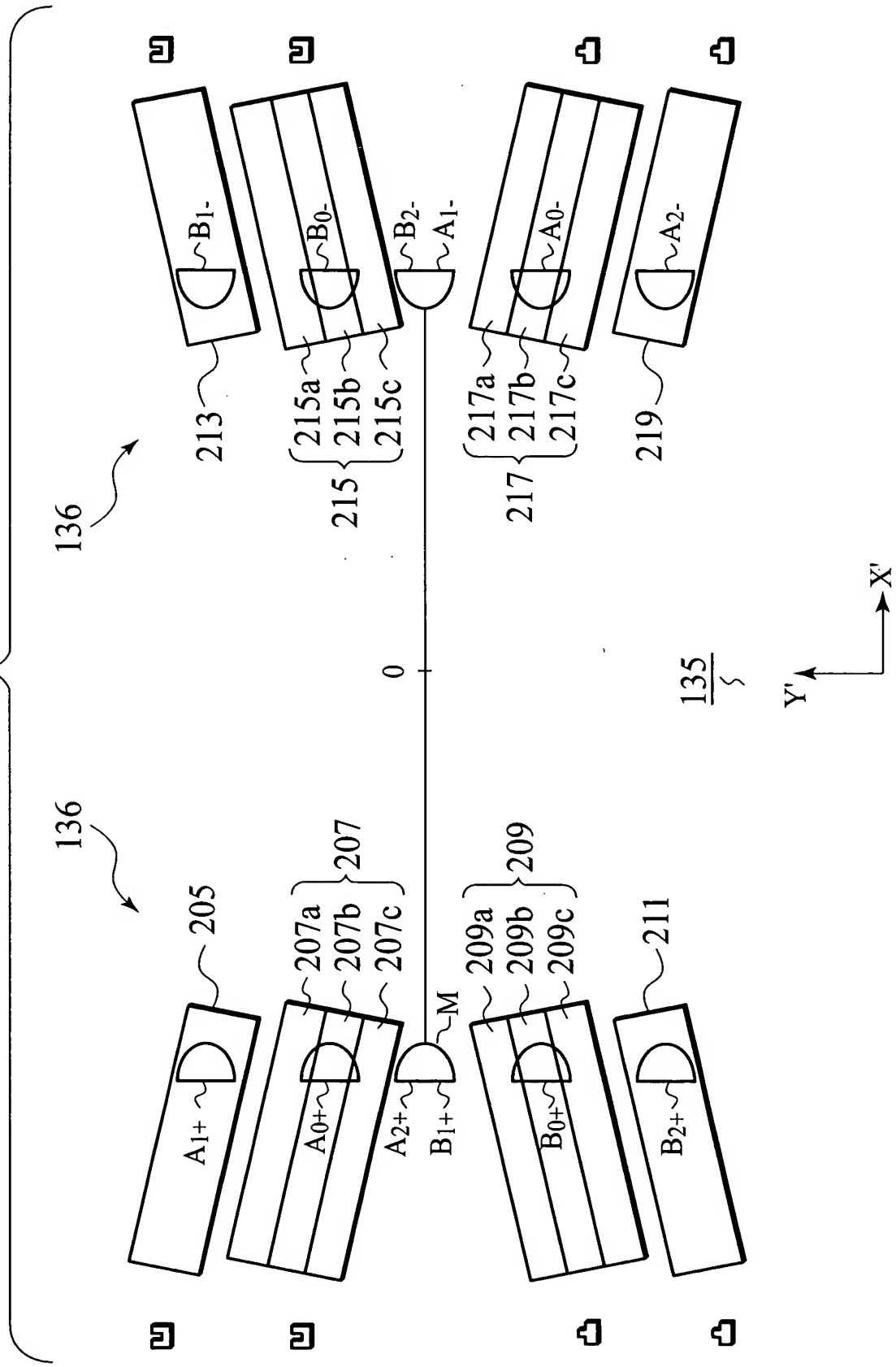

136
213
B1-
215
215a
215b
215c
B0-
B2-
A1-
217
217a
217b
217c
A0-
219
A2-
0
135
Y'
X'
136
205
A1+
207
207a
207b
207c
A0+
M
A2+
B1+
209
209a
209b
209c
B0+
211
B2+

FIG. 13

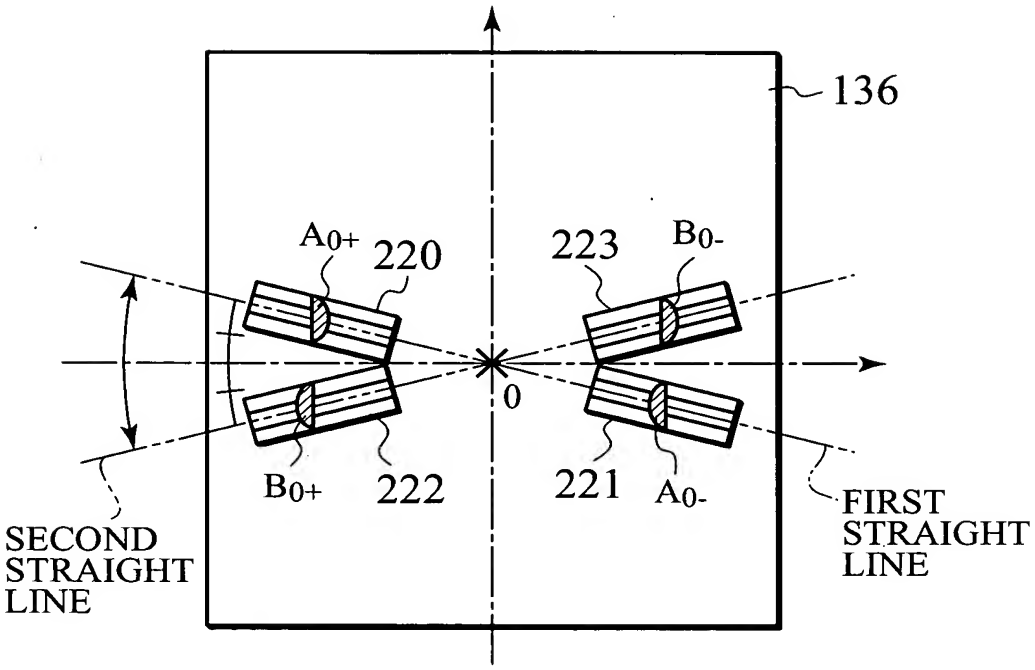

136
A0+
220
223
B0-
0
B0+
222
221
A0-
SECOND STRAIGHT LINE
FIRST STRAIGHT LINE

FIG. 14

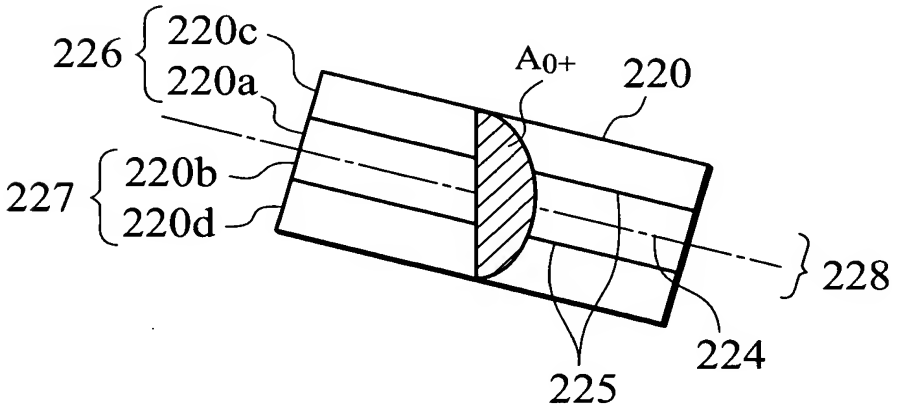

226
220c
220a
A0+
220
227
220b
220d
228
224
225

FIG. 15

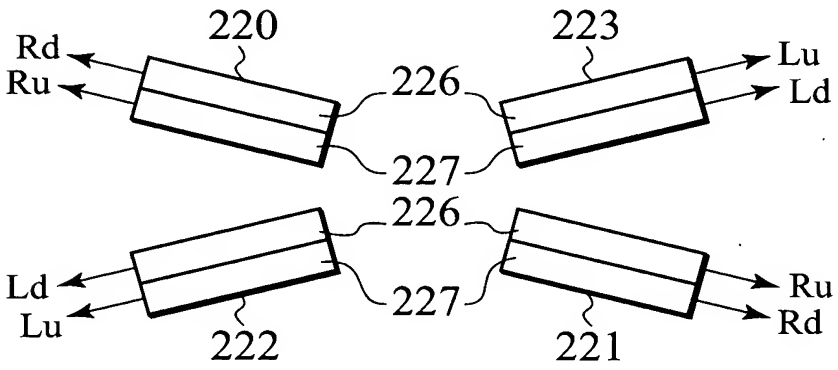

220
223
Rd
Ru
226
Lu
Ld
227
226
Ld
Lu
227
Ru
Rd
222
221

FIG. 16

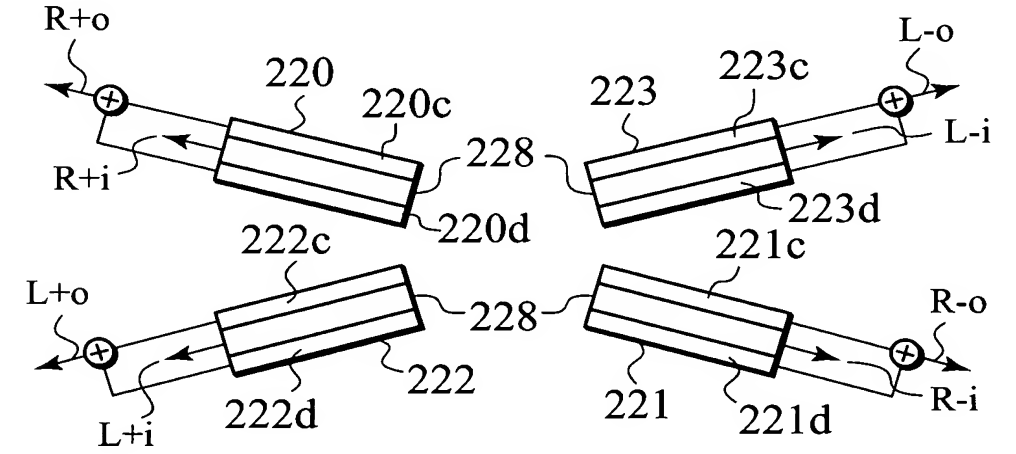

R+o
220
220c
223
223c
L-o
L-i
R+i
228
223d
220d
222c
221c
L+o
228
R-o
222
221
R-i
222d
221d
L+i

FIG. 17

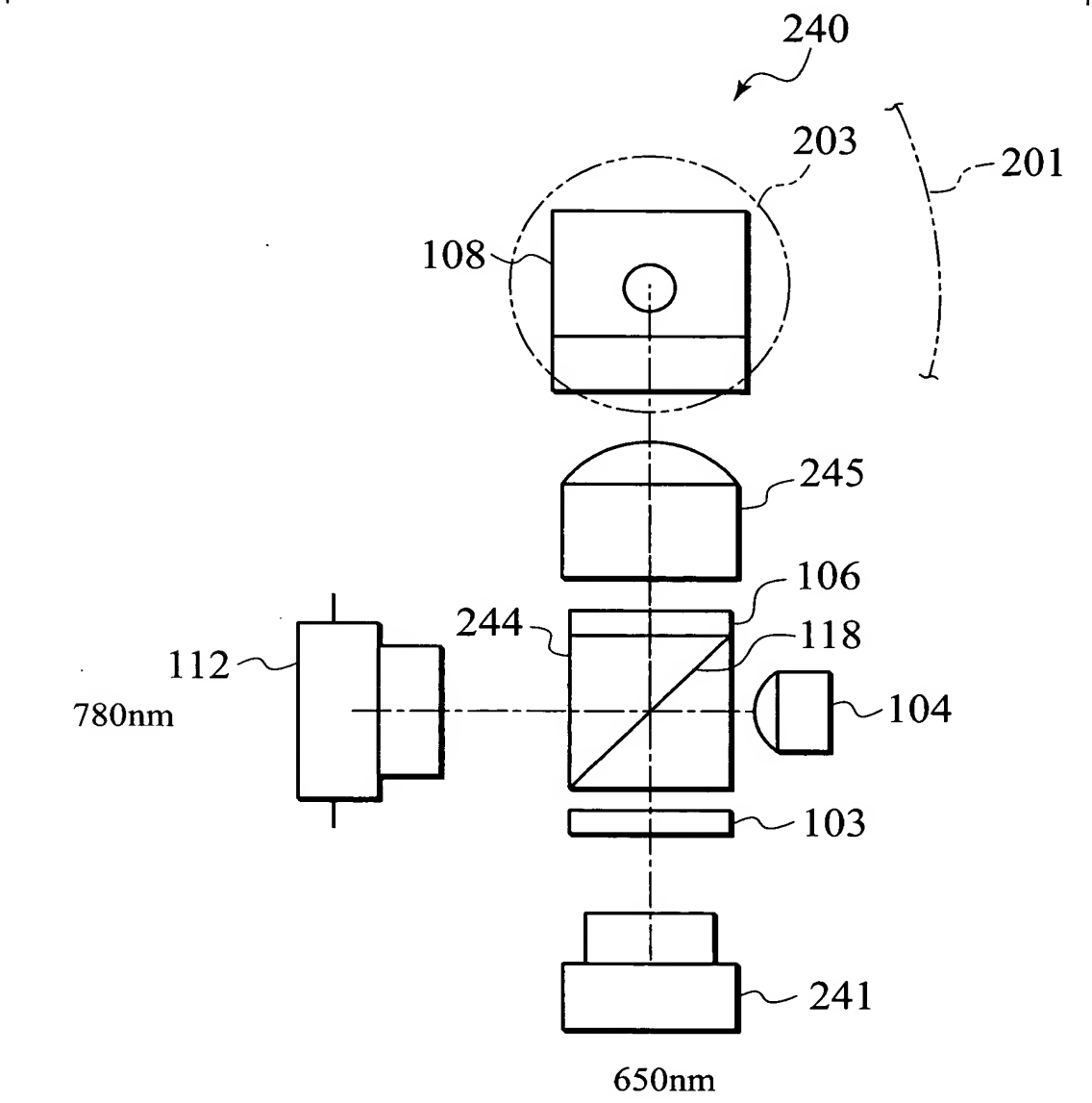


FIG. 18

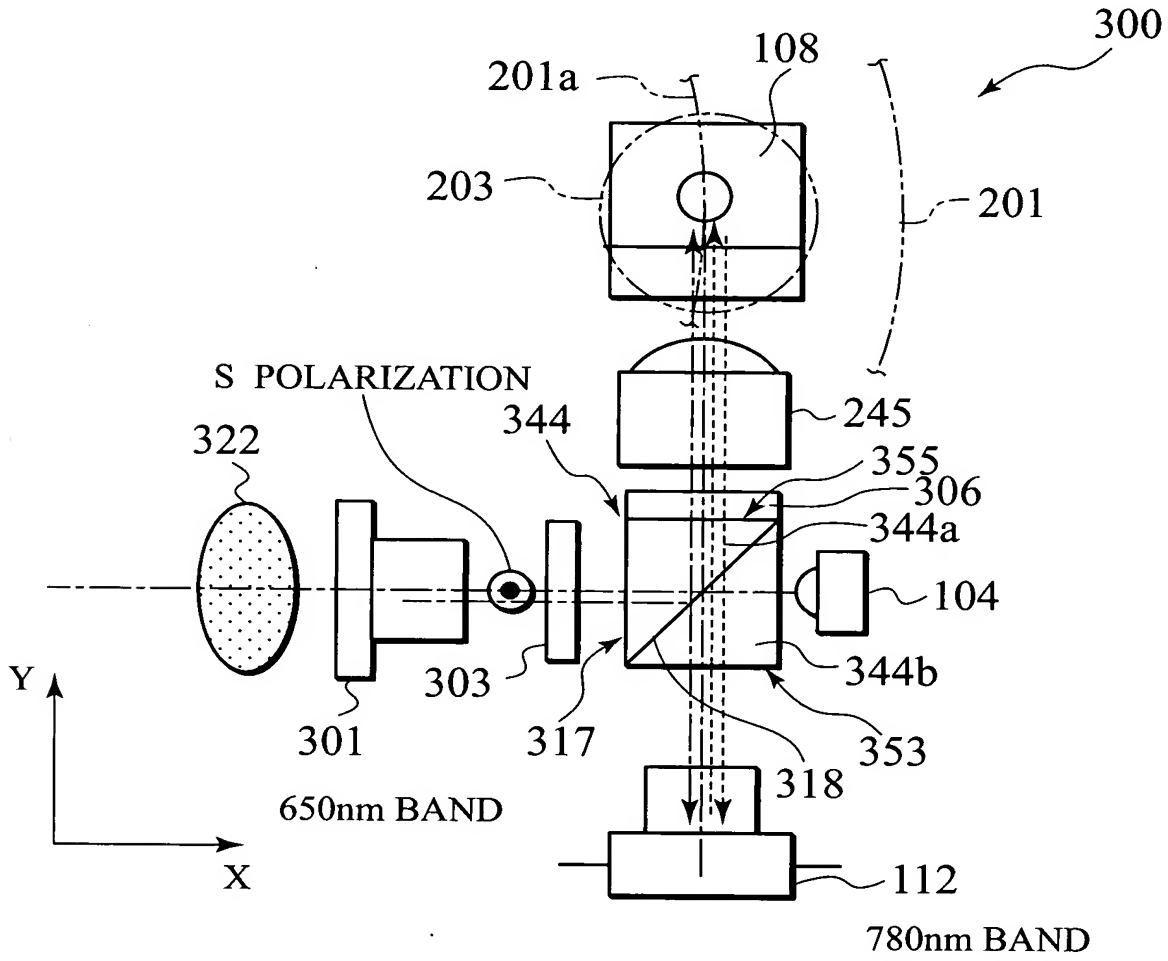

300
108
201a
203
201
S POLARIZATION
344
245
322
355
306
344a
104
303
344b
301
317
353
318
650nm BAND
112
780nm BAND
Y
X

FIG. 19

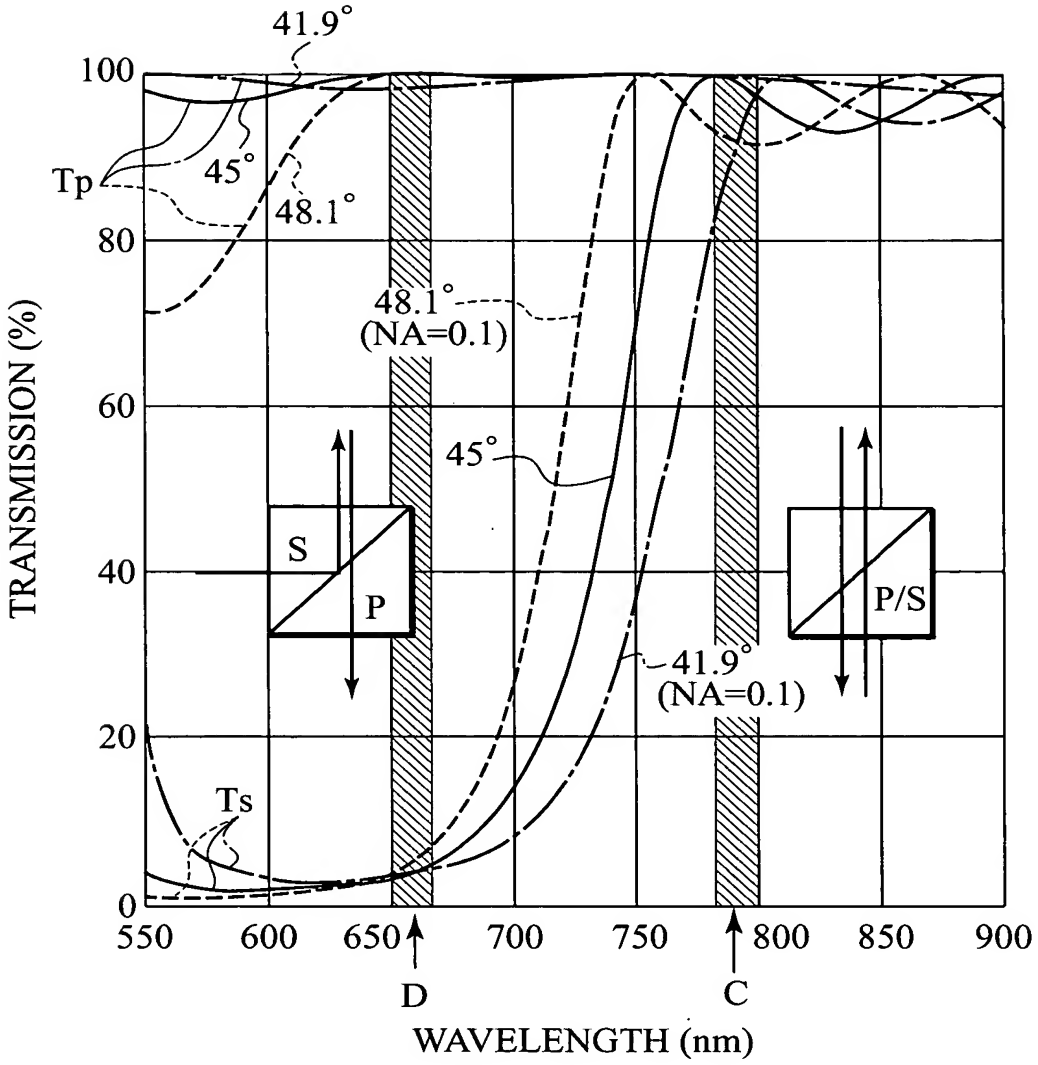
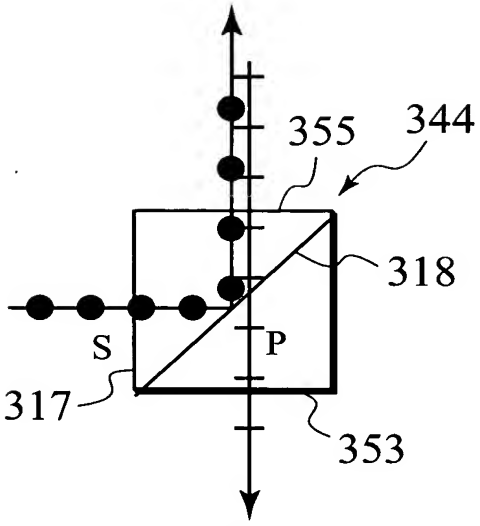

41.9°
100
Tp
45°
48.1°
80
48.1°
(NA=0.1)
60
45°
S
P
P/S
40
41.9°
(NA=0.1)
20
Ts
0
550
600
650
700
750
800
850
900
D
C
TRANSMISSION (%)
WAVELENGTH (nm)

FIG. 20

A DESIGN EXAMPLE OF PBS / NPBS LAYER FOR WAVELENGTH SELECTION

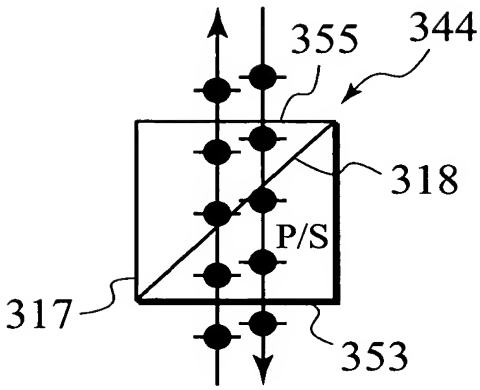
		MATERIAL	REFRACTIVE INDEX (nd) [587.56nm]	THICKNESS [nm]
	GLASS	SF57	1.847	
1	L	LaF_3	1.55	106.46
2	H	TiO_2	2.24	121.18
3	L	LaF_3	1.55	45.00
4	H	TiO_2	2.24	130.45
5	L	LaF_3	1.55	86.73
6	H	TiO_2	2.24	131.12
7	L	LaF_3	1.55	86.72
8	H	TiO_2	2.24	130.44
9	L	LaF_3	1.55	44.98
10	H	TiO_2	2.24	121.14
11	L	LaF_3	1.55	106.36
	GLASS	SF57	1.847	

FIG. 21A



POLARIZATION SEPARATION

FIG. 21B



POLARIZATION INDEPENDENT

FIG. 22

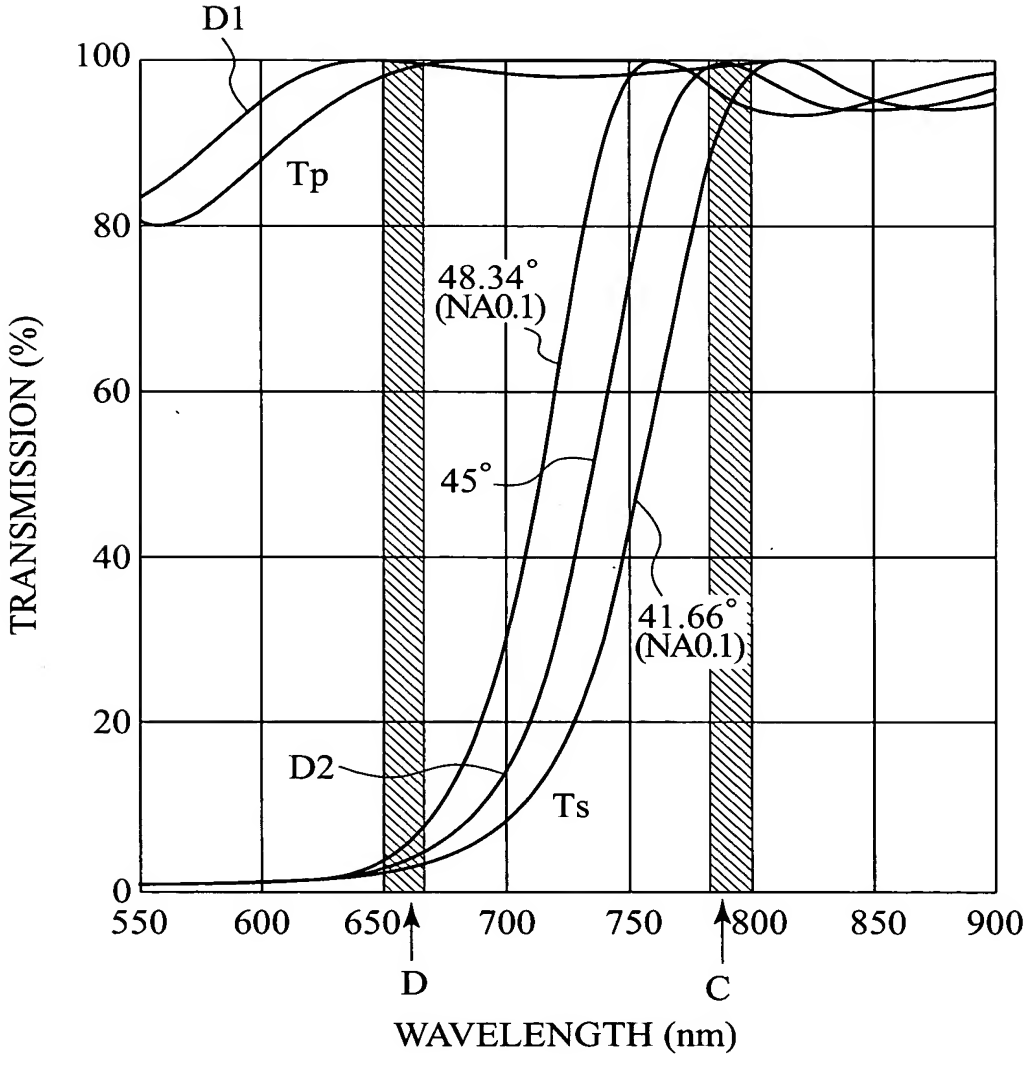

D1
100
Tp
80
48.34°
(NA0.1)
60
45°
40
41.66°
(NA0.1)
20
D2
Ts
0
TRANSMISSION (%)
550
600
650
700
750
800
850
900
D
C
WAVELENGTH (nm)

FIG. 23

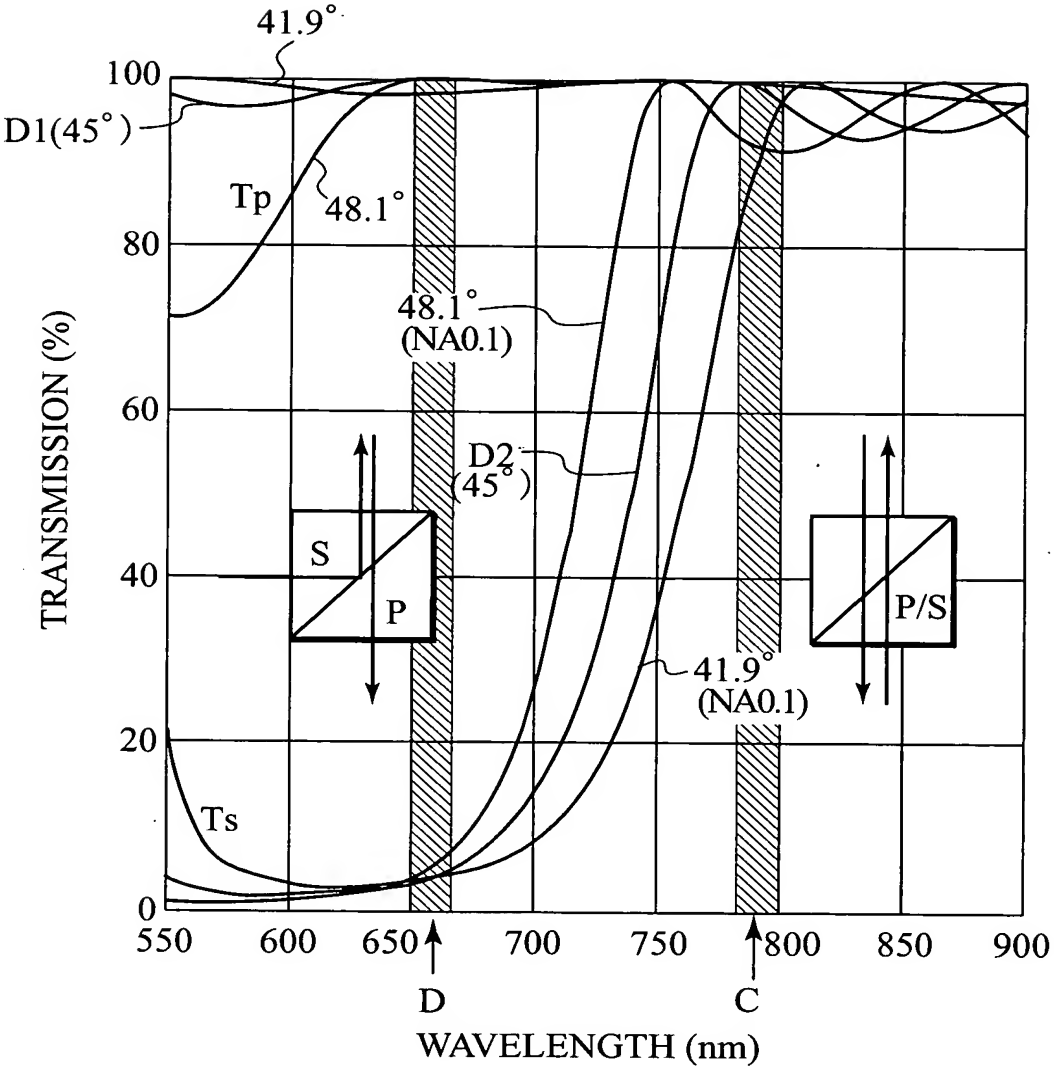

41.9°
100
D1(45°)
Tp
48.1°
80
48.1°
(NA0.1)
60
D2
(45°)
S
P
40
P/S
41.9°
(NA0.1)
20
Ts
0
TRANSMISSION (%)
550
600
650
700
750
800
850
900
D
C
WAVELENGTH (nm)

FIG. 24A

GLASS／	
1	106.46F
2	121.18T
3	45F
4	130.45T
5	86.73F
6	131.12T
7	86.72F
8	130.44T
9	44.98F
10	121.14T
11	106.36F PHYSICAL THICKNESS [nm]
／GLASS	

FIG. 24B

GLASS:SF57 (n_d = 1.847)
T : TiO_2 (n_d = 2.24)
F : LaF_3 (n_d = 1.55)

FIG. 25A

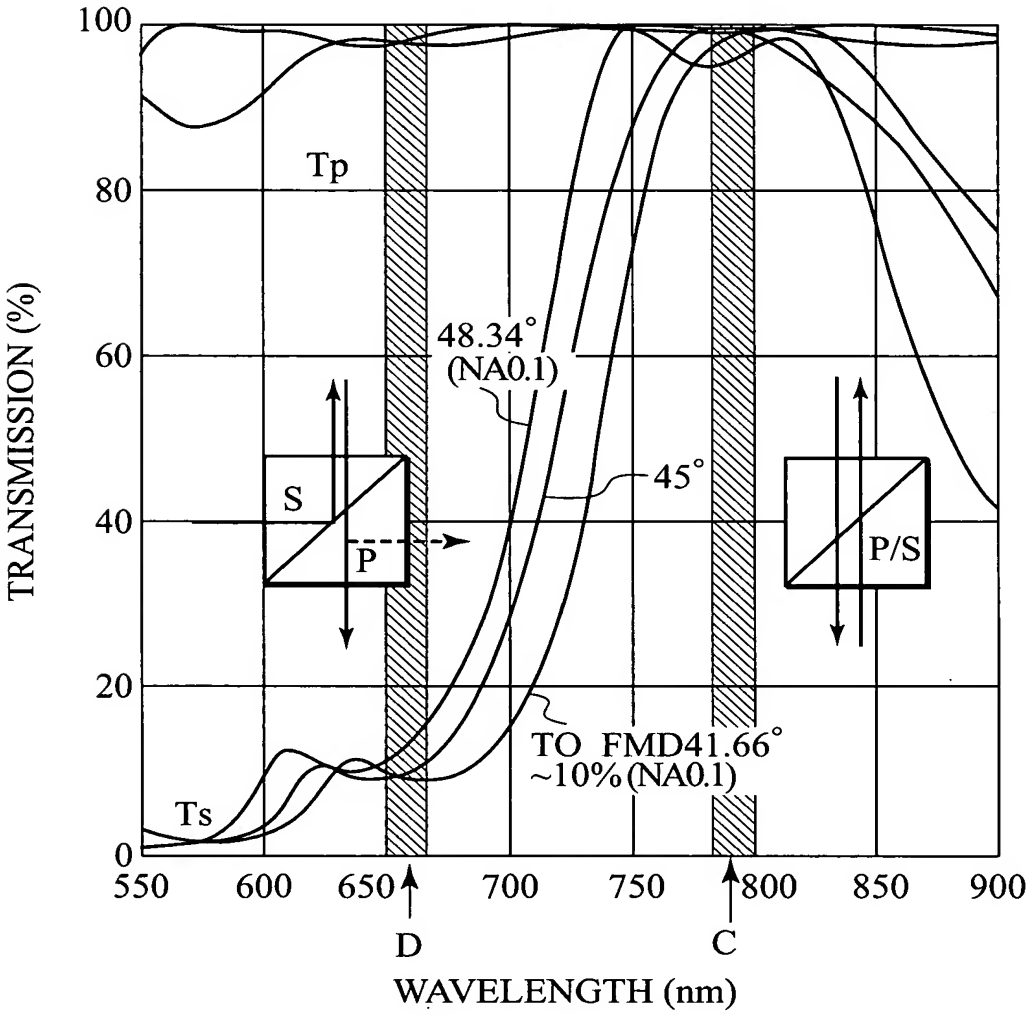

100
80
60
40
20
0
TRANSMISSION (%)
Tp
Ts
48.34°
(NA0.1)
45°
TO FMD41.66°
~10% (NA0.1)
S
P
P/S
550
600
650
700
750
800
850
900
D
C
WAVELENGTH (nm)

FIG. 25B

GLASS／	
1	65.2S
2	691.21T
3	109.17S
4	95.61T
5	109.74S
6	90.02T
7	86.82S
8	82.62T
9	529.41S PHYSICAL THICKNESS [nm]
／GLASS	

FIG. 25C

GLASS:SF1	(n_d = 1.718)
T : TiO_2	(n_d = 2.24)
S : SiO_2	(n_d = 1.46)

FIG. 26

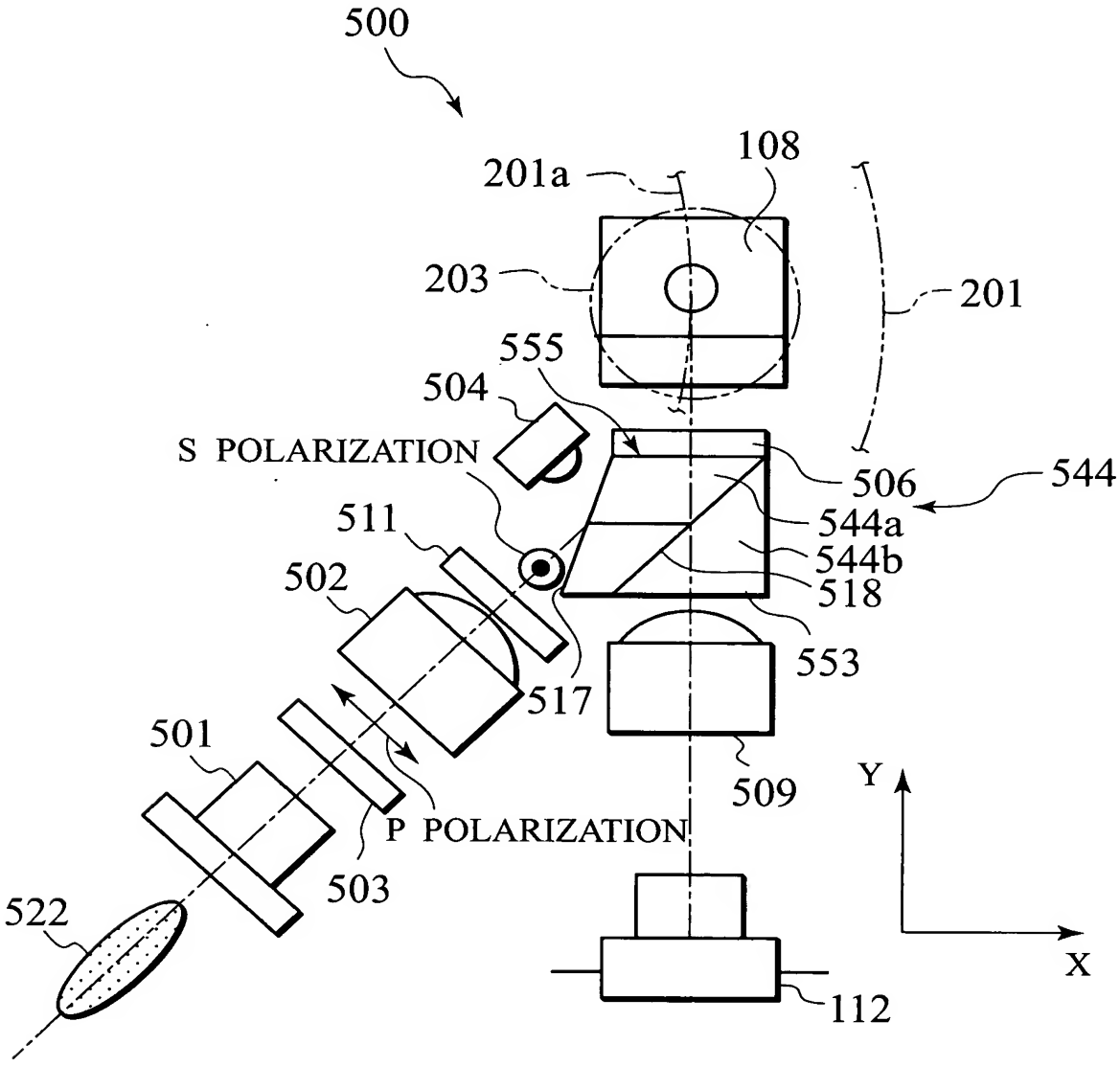

500
108
201a
203
201
555
504
S POLARIZATION
506
544
544a
511
544b
502
518
553
517
501
509
Y
P POLARIZATION
503
522
X
112

FIG. 27

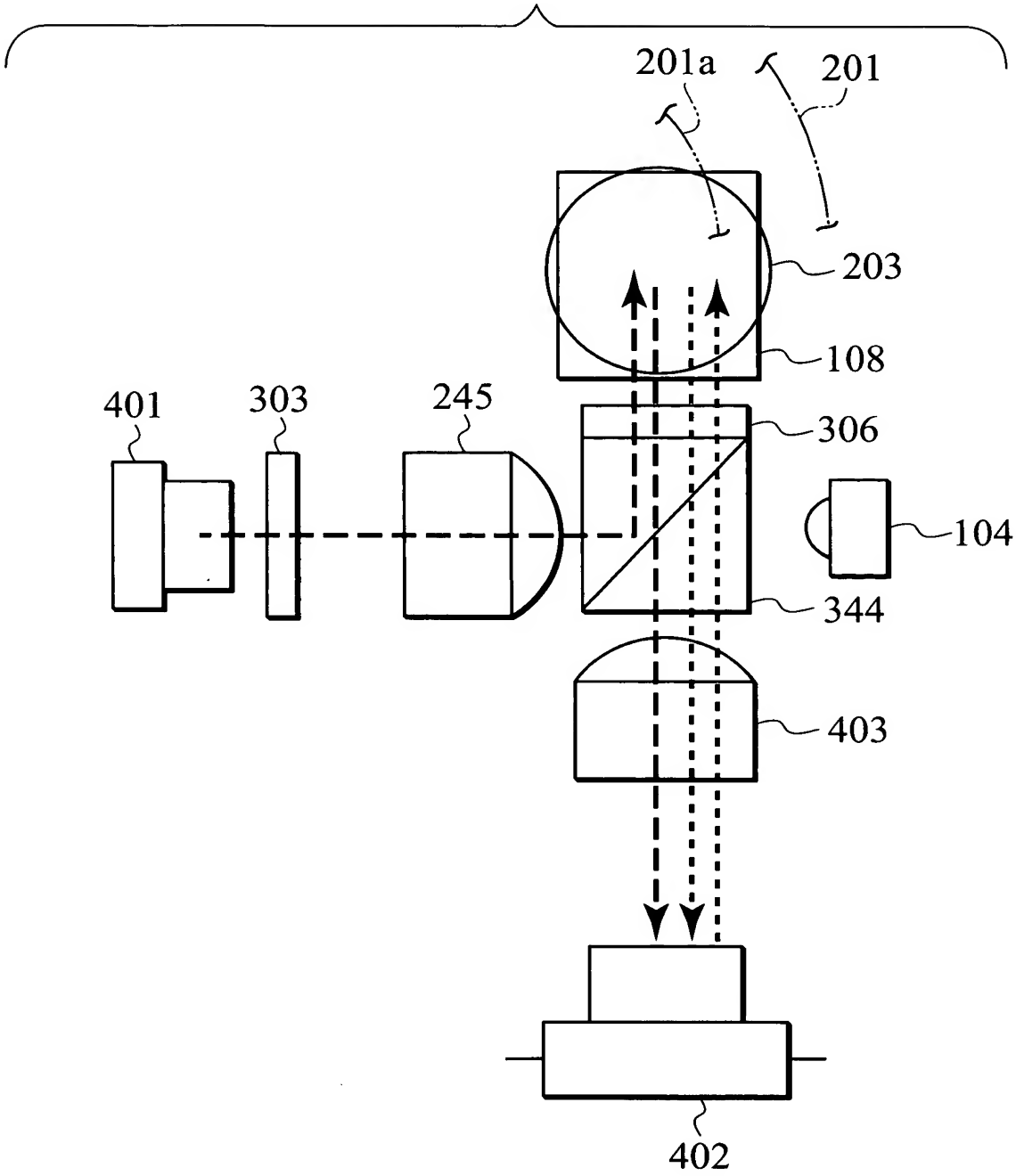


FIG. 28A

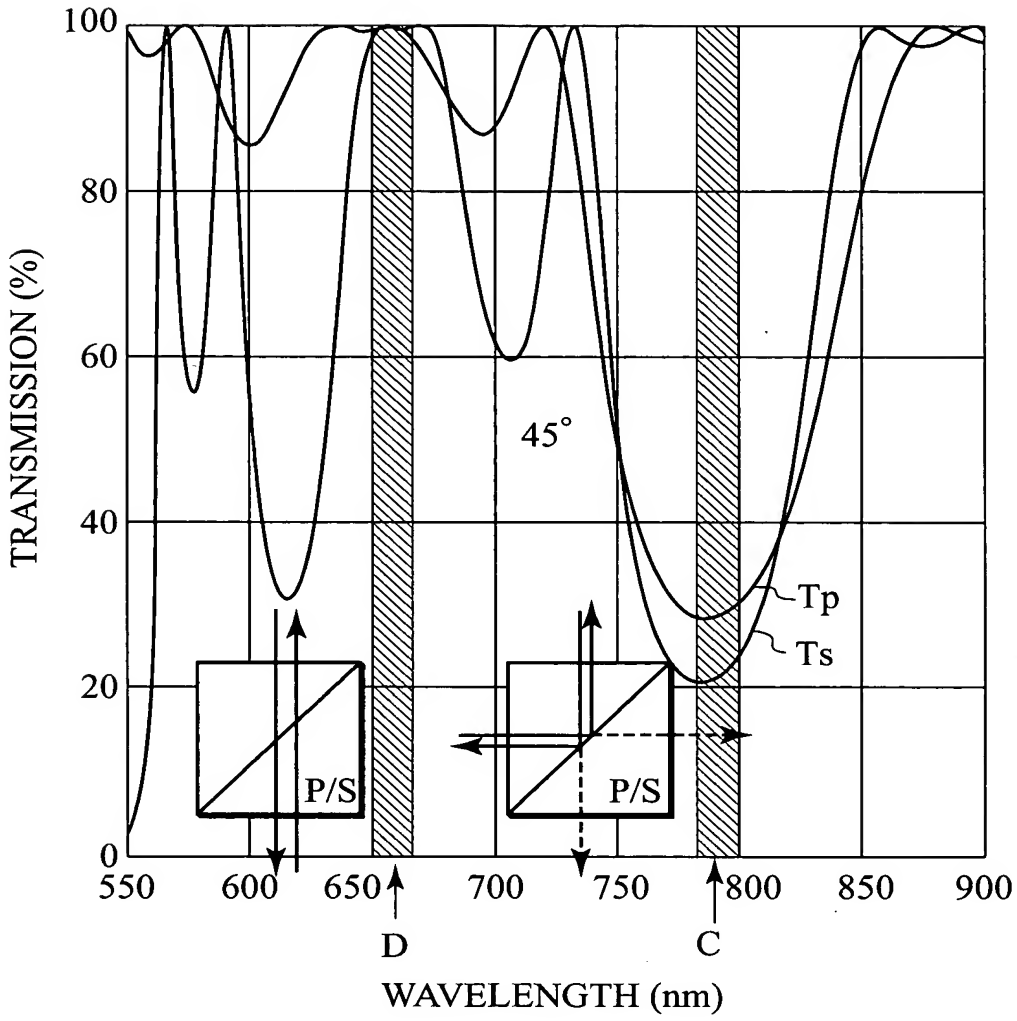

100
80
60
40
20
0
TRANSMISSION (%)
45°
Tp
Ts
P/S
P/S
550
600
650
700
750
800
850
900
D
C
WAVELENGTH (nm)

FIG. 28B

GLASS／	
1	.40284H
2	1.17335M
3	1.15856L
4	.9177M
5	.96964H
6	.9128M
7	1.06792L
8	.83839M
9	.89342H
10	1.04261M
11	1.13475L
12	1.04261M
13	.89342H
14	.83839M
15	1.06792L
16	.9128M
17	.96964H
18	.9177M
19	1.15856L
20	1.17335M
21	.40284H PHYSICAL THICKNESS [nm]
／GLASS	

FIG. 28C

GLASS:BK7 (n_d = 1.5163)
H : (n_d = 2.35)
M : (n_d = 1.58)
L : (n_d = 1.35)
λ DESIGN = 1100 [nm] *QWOT=1

FIG. 29

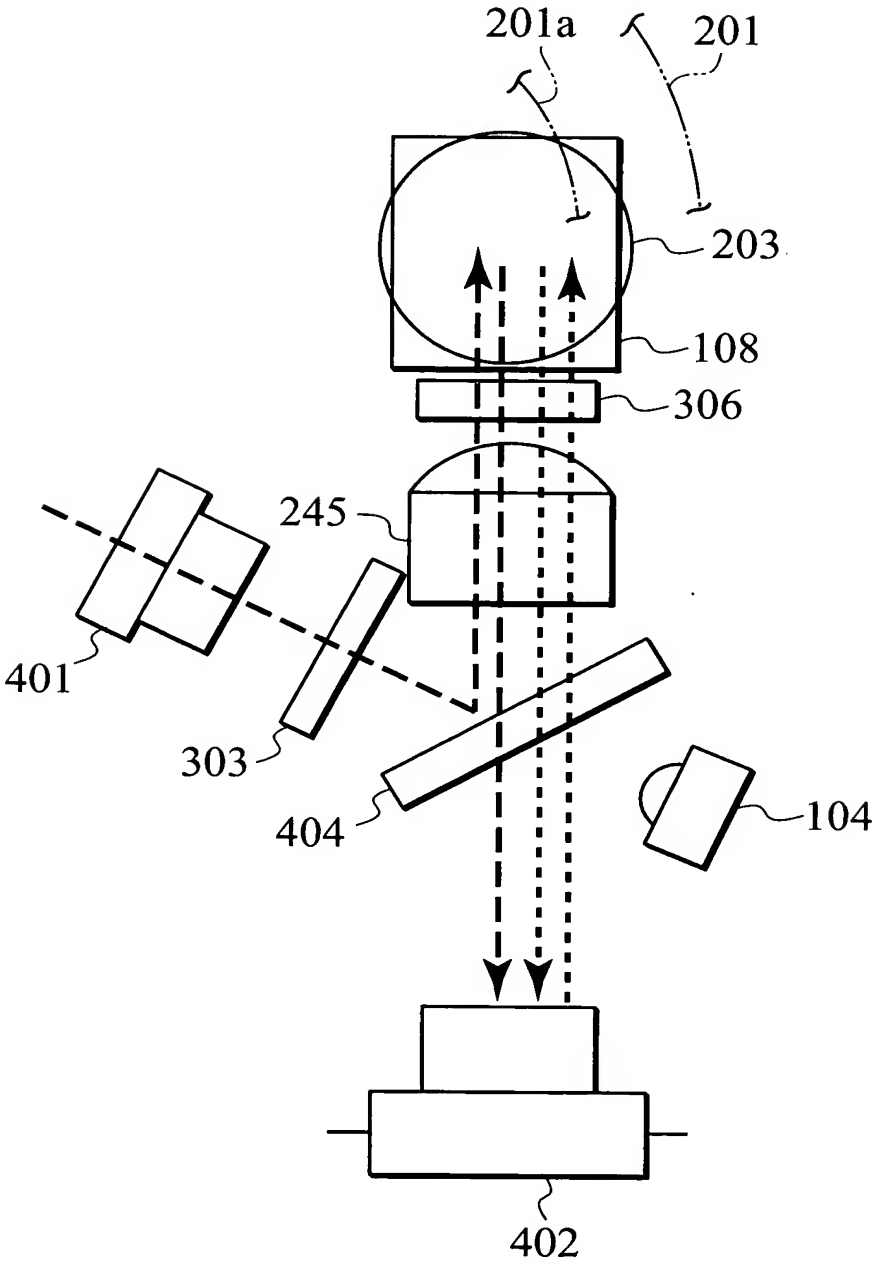


FIG. 30A

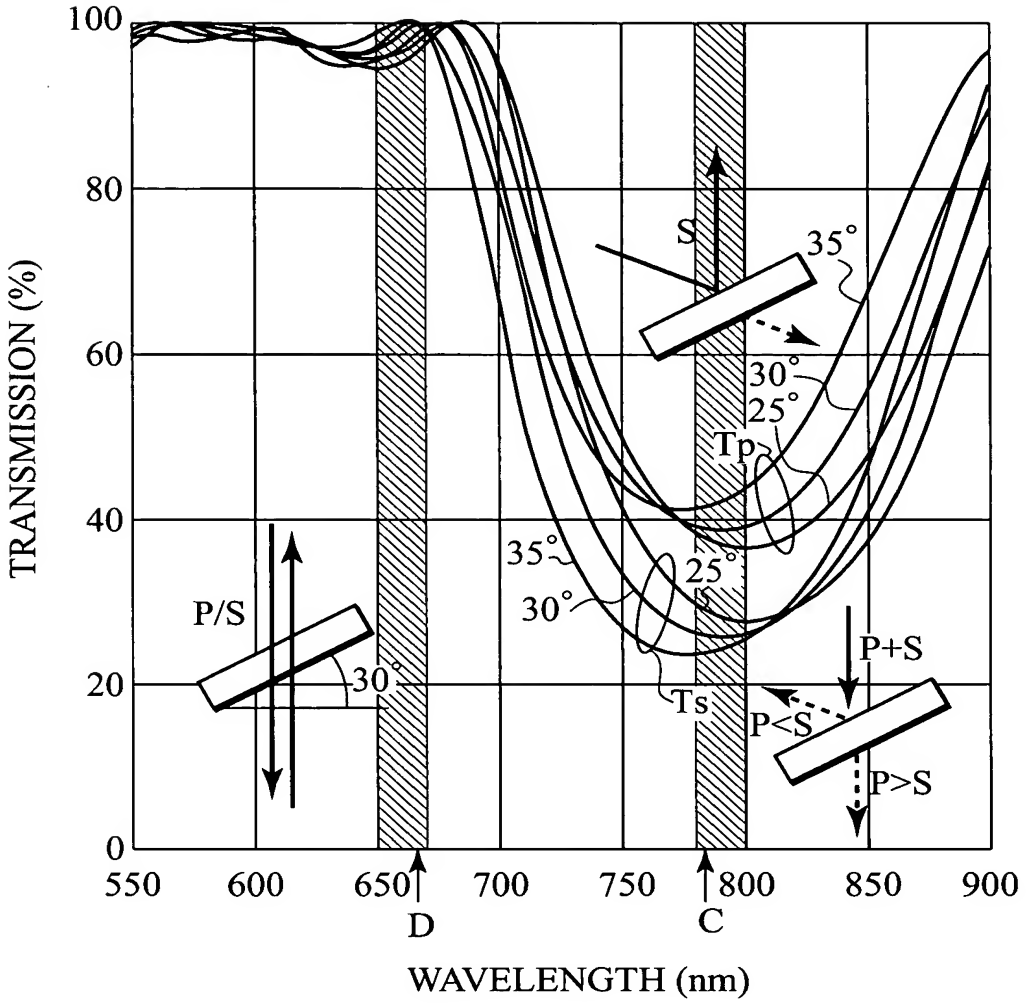

100
80
60
40
20
0
TRANSMISSION (%)
550
600
650
700
750
800
850
900
D
C
WAVELENGTH (nm)
S
35°
30°
25°
Tp
35°
25°
30°
S
P/S
30°
Ts
P+S
P<S
P>S

FIG. 30B

AIR／	
1	1.01541H
2	1.08053L
3	.98725H
4	.7809L PHYSICAL THICNESS [nm]
／GLASS	

FIG. 30C

GLASS : HIGH TRANSPARENCY (MEASUREMENT)
H : TiO_2 (n_d = 2.24)
L : MgF_2 (n_d = 1.38)
λ DESIGN = 2370 [nm]
*QWOT=1

FIG. 31

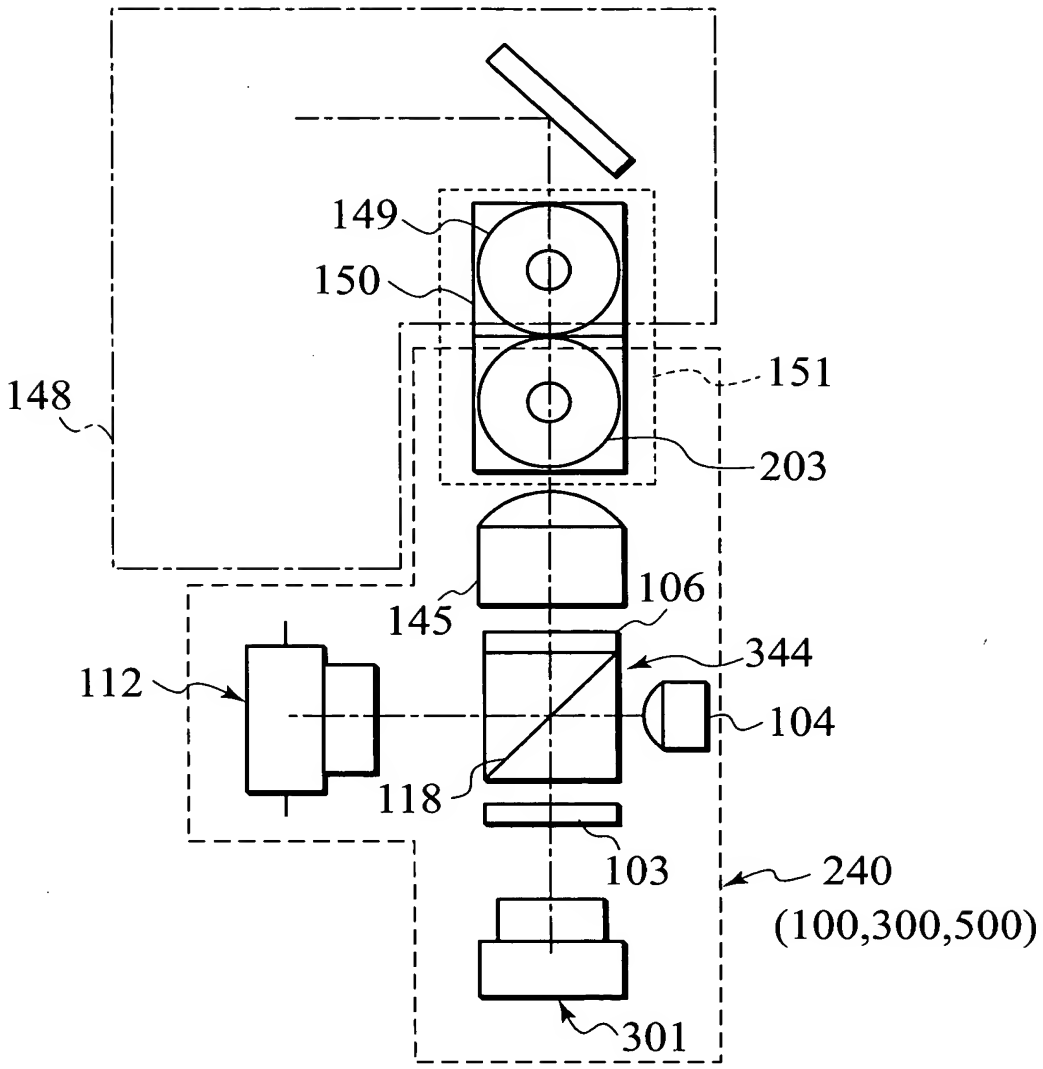

149
150
151
148
203
145
106
344
112
104
118
103
240
(100,300,500)
301

FIG. 32

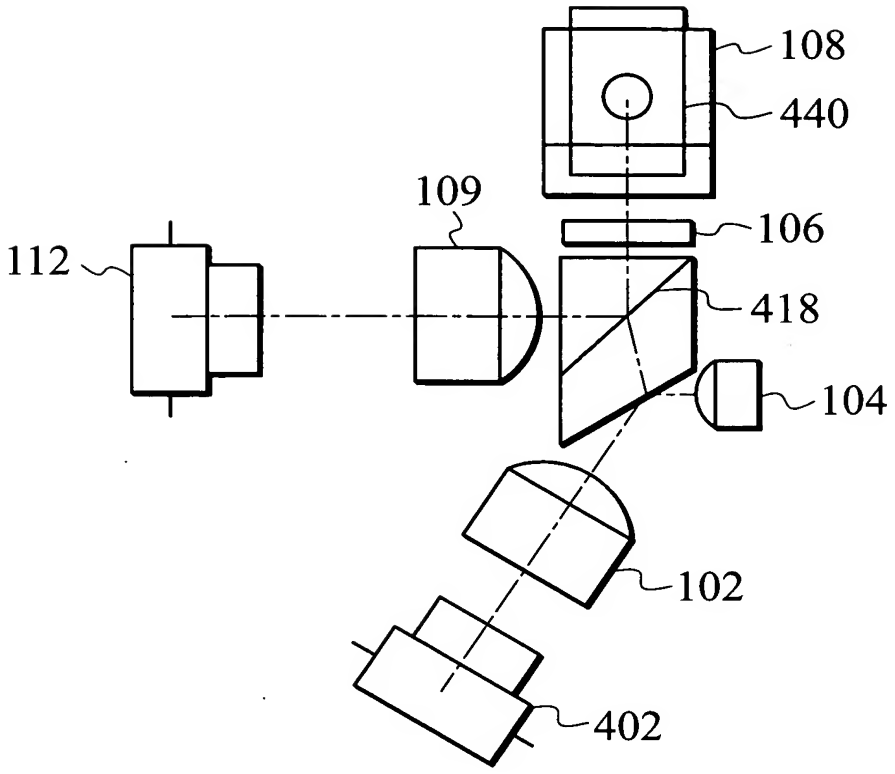
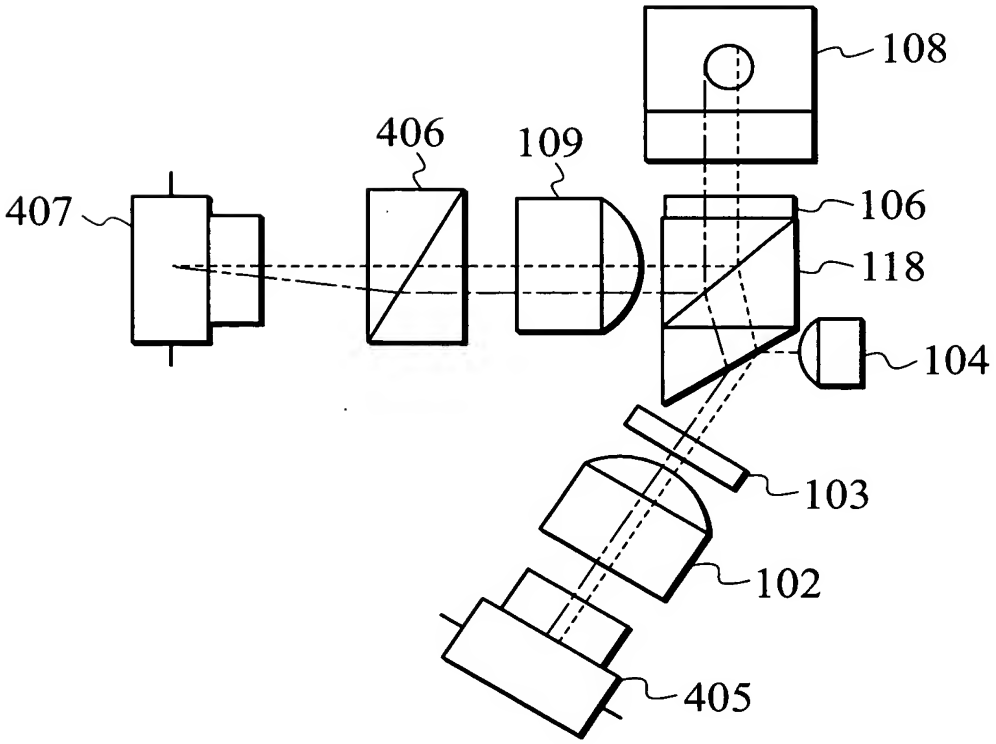

108
440
109
106
112
418
104
102
402

FIG. 33


108
406
109
407
106
118
104
103
102
405